

PATENT COOPERATION TREATY

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INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY


(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

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| Applicant's or agent's file reference BPIMEC223BWO | | FOR FURTHER ACTION | | See Form PCT/IPEA/416 |
| International application No. PCT/BE2004/000182 | | International filing date (day/month/year) 22.12.2004 | | Priority date (day/month/year) 22.12.2003 |
| International Patent Classification (IPC) or national classification and IPC G01N33/543 | | | | |
| Applicant INTERUNIVERSITAIR MICROELEKTRONICA CENTR... et al. | | | | |
| <p>1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 4 sheets, including this cover sheet.</p> <p>3. This report is also accompanied by ANNEXES, comprising:</p> <p>a. <input checked="" type="checkbox"/> sent to the applicant and to the International Bureau a total of 3 sheets, as follows:</p> <p><input checked="" type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).</p> <p><input type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.</p> <p>b. <input type="checkbox"/> (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).</p> | | | | |
| <p>4. This report contains indications relating to the following items:</p> <p><input checked="" type="checkbox"/> Box No. I Basis of the opinion</p> <p><input type="checkbox"/> Box No. II Priority</p> <p><input type="checkbox"/> Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</p> <p><input type="checkbox"/> Box No. IV Lack of unity of invention</p> <p><input checked="" type="checkbox"/> Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</p> <p><input type="checkbox"/> Box No. VI Certain documents cited</p> <p><input type="checkbox"/> Box No. VII Certain defects in the international application</p> <p><input type="checkbox"/> Box No. VIII Certain observations on the international application</p> | | | | |
| Date of submission of the demand 20.10.2005 | | Date of completion of this report 20.03.2006 | | |
| Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 eprmu d Fax: +49 89 2399 - 4465 | | Authorized Officer Weijland, A Telephone No. +49 89 2399-7490 | | |



**INTERNATIONAL PRELIMINARY REPORT
ON PATENTABILITY**

International application No.
PCT/BE2004/000182

Box No. I Basis of the report

1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.
- ☐ This report is based on translations from the original language into the following language , which is the language of a translation furnished for the purposes of:
- ☐ international search (under Rules 12.3 and 23.1(b))
 - ☐ publication of the international application (under Rule 12.4)
 - ☐ international preliminary examination (under Rules 55.2 and/or 55.3)
2. With regard to the **elements*** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

Description, Pages

1-49 as originally filed

Claims, Numbers

1-20 received on 25.01.2006 with letter of 20.01.2006

Drawings, Sheets

1/4-4/4 as originally filed

- ☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing

3. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages
- ☐ the claims, Nos.
- ☐ the drawings, sheets/figs
- ☐ the sequence listing *(specify)*:
- ☐ any table(s) related to sequence listing *(specify)*:

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

- ☐ the description, pages
- ☐ the claims, Nos.
- ☐ the drawings, sheets/figs
- ☐ the sequence listing *(specify)*:
- ☐ any table(s) related to sequence listing *(specify)*:

* If item 4 applies, some or all of these sheets may be marked "superseded."

**INTERNATIONAL PRELIMINARY REPORT
ON PATENTABILITY**

International application No.
PCT/BE2004/000182

Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

| | | |
|-------------------------------|-------------|------|
| Novelty (N) | Yes: Claims | |
| | No: Claims | 1-20 |
| Inventive step (IS) | Yes: Claims | |
| | No: Claims | 1-20 |
| Industrial applicability (IA) | Yes: Claims | 1-20 |
| | No: Claims | |

2. Citations and explanations (Rule 70.7):

see separate sheet

The following documents (D) are referred to in this opinion; the numbering will be adhered to the rest of the procedure:

D1: JOURNAL AMERICAN CHEMICAL SOCIETY 2003, 125, PAGES 14994-14995

Novelty (Article 33(2) PCT)

1. The subject matter of claims 1-20 is not novel.

D1 (Figures 1, 2, 3a) describes the use of the Diels-adler reaction to immobilize selectively a ligand, such as the RGD peptide ("recognition molecule" according to claim 1) to mediate the adhesion of cells ("analyte", "method for sensing a binding event", "method for depositing molecules onto a surface" according to claims 1, 15 and 16). The ligands, i.e. RDG peptide, can also be released from the surface and therefore the grown cells can be released. For this purpose a monolayer presenting a O-silyl-hydroquinone undergoes electrochemical oxidation ("thermal **or** electrochemical activation element", "sensor surface", "thermal **or** electrochemical activation step", "electrochemical spotting" according to claims 1, 13, 14) to give a benzoquinone, followed by the hydrolysis of silyl ether and the selective release of the RDG ligand. The resulting benzoquinone reacts with RDG-Cp to immobilize said ligand. An optical micrograph ("electrically detect" according to claim 1) shows that Swiss 3T3 fibroblast cells were adhered over a region presenting fibronectin and an RGD peptide.

CLAIMS

1. A sensing device for sensing a specific binding between an analyte and a recognition molecule, comprising a sensor with a micro-electronically addressable sensor surface comprising an individually addressable thermal and/or electrochemical activation element arranged to activate said sensor surface and a recognition molecule covalently bound to said sensor surface by at least a thermal and/or electrochemical activation step, wherein said sensor is arranged to electrically detect or sense a specific binding between said recognition molecule and an analyte.

2. A sensing device as recited in claim 1 wherein the sensing device is a field effect transistor.

3. The sensing device as in claim 1 or 2 comprising a plurality of micro-electronically individually addressable sensor surfaces, each sensor surfaces being individually activatable.

4. The sensing device as in any of the preceding claims comprising a plurality of micro-electronically individually addressable sensors.

5. The sensing device as in any of the preceding claims wherein the sensor surface comprises an anchoring layer.

6. The sensing device of claim 5 wherein the anchoring layer is selected from the group consisting of chemical molecules or a metal layer.

7. The sensing device of claim 5 or 6 wherein the anchoring layer is activatable by electrochemical actuation.

8. The sensing device of any one of the preceding claims, wherein said activation element is an electrochemical activation element.

9. The sensing device of claim 8 wherein the sensor surface comprising a surface layer, the surface layer comprising a material arranged to allow electrontransfer over said surface layer.

10. The sensing device according to claim 9 wherein the material of said surface layer is selected from the group consisting of metals, thin oxides, semiconductors and organic layer.

11. The sensing device of any of the preceding claims 1 to 8, wherein said activation element is a thermal activation element.

12. The sensing device according to claim 11 wherein said thermal activation element is selected from the group consisting of a resistor, a microwave heatable element and a peltier element.

13. The use of a microelectronic device for localised/patterned deposition and/or desorption of (bio)molecules onto the surface of a device using addressable microelectronic structures, whereby adsorption or deposition and/or desorption of (bio)molecules on said surface is obtained via electrochemical spotting.

14. The use of a device for localised/patterned deposition and/or desorption of (bio)molecules onto the surface of a device using addressable structures wherein the adsorption of deposition and/or desorption of (bio)molecules on said surface is obtained via electrochemical spotting.

15. A method for sensing a binding event, said method comprising the following steps:

- providing a sensing device such as in any of the claims 1 to 10,
- activating the sensor surface,

- depositing recognition molecules from a liquid or vapour phase,
- detecting a binding event between said recognition molecule and an analyte.

16. A method for depositing molecules onto a surface, said method comprising the following steps:

- providing a device such as in any of the claims 1 to 10, said device comprising a plurality of surfaces wherein at least one surface is individually thermally activatable,
- activating the at least one surface,
- depositing molecules onto the at least one surface.

17. A method as recited in claim 15 further comprising the step of selecting at least one surface followed by the activation step.

18. A method as recited in claim 15 wherein the device is a micro-electronic chip.

19. A method as recited in claim 15 wherein the activation step is activation by laser light.

20. A method as recited in claim 15 wherein said device further comprise an individually thermally activatable micro-electronic structure for activating the at least one surface.